Efficacy of Bio- Rational Insecticides Against H. Armigera in Bell Pepper Under Field Conditions

Nazatinder Singh
Department of Entomology
Punjab Agricultural University 141004

Naveen Aggarwal
Department of Entomology
Punjab Agricultural University 141004

ABSTRACT
Fruit borer, *Helicoverpaarmigera* (Hübner) is the most destructive insect pestthat devastates the crop of bell pepper, a widely consumed vegetable in India. Bell Pepper (*Capsicum annuum* L. var. grossumSendt; 2n = 24), is also known as Capsicum, sweet pepper, SimlaMirch, vegetable paprika, etc. In an effort to control its spread, we tested a spectrum of pesticides and showed that under fieldconditions, and emamectin benzoate aremost efficient in reducing larval population percent fruit infestation with highest number of healthy fruits in these treatments. Based on weight of fruits of bell pepper per plant, spinosad and emamectin benzoate are found to be most effective. Treatments with spinosad and emamectin benzoate provide highest marketable fruit yields withhighest B: C ratio recorded in plots treated with spinosad and emamectin benzoate

Keywords
Spinosad, Emamectin Benzoate, *Trichogramma*, *B. thuriengensis*, *B. bassiana*, HaNPV

1. INTRODUCTION
Vegetable cultivation has evolved as suitable option for diversification in agriculture in the last decade that transformed the farming system into a high value commercial sector leading to the revolutionary changes in the socio economic status of farmers in the country. India occupies 9.20 million hectare area under the vegetable cultivation with the total production of 162.18 million tonnes and ranks second largest producer of vegetables in the world [11]. In Punjab, the vegetables are grown in an area of 0.184 million hectare producing 3.78 million tonnes with average productivity of 20.5 tonnes per hectare [11]. The bell pepper (Capsicum annuum L. var. grossumSendt; 2n = 24) is one of the important vegetables consumed in IndiaOf all the pests that attack bell pepper Fruit borer, *Helicoverpaarmigera* (Hübner) causes most damage to bell pepper crop , especially during the dry season. H. armigera causes yield loss of chili pepper up to 60 per cent [10] Many strategies are designed to control its population. Secondary metabolites from microbes are also known to kill various insects including H. armigera and S. litura. Moreover, among the bacteria, Bacillus thuringiensis (Bt) is the most studied due to the efficacy of the toxins (cry toxins) it produces to kill the larvae of H. armigera [6]. Two releases of a natural enemy *Trichogrammachilonis* Ishi @ 2.5 lakh ha^{-1} caused maximum egg reduction(55.79 percent) of *H. armigera* during field trails in chilli ecosystem[9].

On comparing four IPM modules on bell pepper pests at Dharwad, Karnataka and it is reported that the population density of fruit borer, H. armigera at different intervals 70, 85, 100 and 115 DAT was significantly less in M-I (0.08, 0.10, 0.12 and 0.12 respectively) and was on par with M-II (0.12, 0.20, 0.20 and 0.24 larvae/plant) [6]. It is reported that treatment schedule with Nimbecidine- Nimbecidine-spinosad-GCKE- spinosad was effective against H. armigera on bell pepper. Among different schedules, the Nimbecidine-Nimbecidine-Spinosad-Garlic, Chilli Kerosene Extract-Spinosad treatment was effective against H. armigera by recording least larval infestation and fruit damage [7].

2. MATERIALS AND METHODS
The seedlings of capsicum, variety Indra, were raised in nursery in third week of October. The nursery was protected from frost with polythene cover in the field. Six week old seedlings were transplanted on both sides of the raised beds in plots measuring 4.0 x 3.3 m^2 with three replications in randomized block design (RBD) in the first week of December to establish the seedlings before sudden change in temperature. The treatment in which Tricho cards were to be released planted as separate block following restricted randomization. These plots were covered with plastic sheets to avoid frost damage. The seedlings were planted on ridges 60 cm apart with a plant-to-plant distance of 30 cm by practicing low tunnel technology [1].

2.1 Efficacy of insecticides
The individual treatments were given on the first appearance of pest/damage in the field and repeated after ten days if required. The different treatment doses were applied after calculating the expected field doses as per results of bioassay experiments except in treatment where tricho cards of egg parasitoid, *Trichogrammachilonis* were released, as shown in table

Treatment	**Dose (g or ml L^{-1})**
Spinosad 45 SC	0.64
Emamectin benzoate 5 SG	0.60
Bacillus thuringiensis var. *kurstaki*8L (17600 I.U. mg^{-1})	3.50
Azadirachtin 1 EC (10000 ppm)	3.20
Beauveriabassiana 10 SC ($1x10^{10}$ conidia ml^{-1})	5.54
HaNPV ($1x10^{9}$PIB ml^{-1})	4.78
Trichogrammachilonis eggs	100000 ha^{-1}
Control	-

[18]. In all two sprays were given during the cropping season. The larval counts were taken from 10 randomly tagged plants from each treatment plot and the observations were recorded one day before spraying and 3, 7 and 10 days after spraying. The numbers of healthy and infested fruits for each treatment along with their weight from whole plot were also recorded at

different stages to find out the efficacy of the treatments. The percentage of fruit borer infested fruits was calculated using the following formula:

Per cent fruit borer infested fruits (by number) =(Number of infested fruits) / (Total number of fruits) *100

Per cent fruit borer infested fruits (by weight) = (Weight of Infested fruits)/ (Total weight of fruits)*100

Reduction over control was calculated using the following formula:

Per cent reduction over control =((Value in untreated control plot)- (value in treated plot))/ (Value in untreated control plot)) *100

Fruits were harvested from each plot separately and yield at each picking was recorded. The cumulative fruit yield was worked out by adding the yield of each picking. The yield per plot was converted to tonnes per hectare. The economics of different treatments was worked out and benefit cost ratio was calculated.

3. RESULTS AND DISCUSSION

We initiated the sprays of respective treatments-spinosad,emamectin,B.thurigeinsis, B.bassiana,azadirachtin,T. chilonis eggs-, after we observed the incidence of H. armigera larvae in the field of bell pepper.. Two sprays of each treatment were given at 10-day interval. As revealed in Table 1, pre-application count of H. armigera larval population was not varied significantly from each other and control during the cropping season of 2013-14. All the treated plots with chemicals were significantly superior in their performance over that of control plots. After 3 days of spraying (DAS), there was reduction in the number of larvae, which ranged from 1.40 to 3.10 per plant. Among the tested insecticides, emamectin benzoate (5 SG) recorded significantly lower number of larvae (1.40/plant), which was equally good to spinosad 45 SC (1.50larvae/plant). The next best treatments were B. thuringiensis 8L (2.20/plant), B. bassiana 10 SC (2.40/plant), azadirachtin 1 EC (2.70/plant), T. chilonis eggs (3.0/plant) and control (3.0/plant). HaNPV (1x109PIB/ml) recorded the maximum number of larvae (3.10/plant). All these treatments were significantly inferior to emamectin benzoate and spinosad 3 DAS. We observed same trend was at 7 DAS. At 10DAS, we recorded highest reduction in the H. armigera population in emamectin benzoate (0.70larvae/plant) followed by spinosad (0.80larvae/plant) but not in other treatments including control. B. thuringiensis recorded significantly lower number of larvae (1.40/plant) in comparison to other treatments though it proved to be inferior to spinosad and emamectin. The treatments of azadirachtin (1.90/plant), B. bassiana (2.0/plant), HaNPV (2.20/plant) and T. chilonis eggs (2.50/plant) recorded lowest reduction of borer population. Highest population was recorded in control (3.10/plant).

Similar trend was observed at 3, 7 and 10 days after second spray. Treatments of spinosad and emamectin benzoate were most efficient in controlling the H. armigera larvae with average population of 0.00 and 0.10larvae/plantrespectively at 10 days after 2nd spray followed by B. thuringiensis and azadirachtin with average population of 0.70 and 1.30larvae/plant, respectively. B. bassiana, HaNPV and T. chilonis were at par with each other with average population of 1.40, 1.60 and 1.90 larvae/plant. We observed a steady increase in the H. armigera population in untreated control plot throughout the experiment. When four neem formulations viz., Neem oil, Neemgaurd, Repelin and Biosol and some synthetic insecticides were tested against bell pepper fruit borers, H. armigera and S. litura. These neem products gave 48.50 to 64.35 percent reduction in fruit damage over control but were inferior to synthetic insecticides and showed moderate efficacy [13]. Two releases of T.chilonis 2.5 lakh ha-1 caused maximum egg reduction of (55.79%) H. armigera in bellpepper ecosystem [9]. In the field trials with B. bassiana, infection rates in H. armigera larvae collected from the experimental plot were remarkably higher at the higher dosage of 2.1×10^4 spores ml^{-1} than at the lower dosage. The larvae collected 25 days after treatment (DAT) developed infection in a maximum period of 32 days after collection from the field [2]. The results of the present study are not much in line with those of the previousresultsas the conditions in which they have used these biopesticides may be different from the conditions of present studies. These studies had been conducted during the warmer months of March to May and the higher temperature during this period may be the reason for their lower efficacy. The schedule of Nimbecidine-Nimbecidine-spinosad-garlic chilli kerosene extract- spinosad treatment was effective against chilli fruit borer, H. armigera by recording least larval infestation and fruit damage [7]. In West Bengal, study evaluating five pesticides (Spinetorum 12.5 SC @ 40 & 60 g a.i., Spinosad 45 SC @ 50 & 75 g a.i., Chlorpyrifos 20 EC @ 350 g. a.i., Fipronil 5 SC @ 50 g a.i. and triazophos 40 EC @ 250 g a.i/ha) showed that the fruit borer infestation was sharply reduced in spinetorum treated plot that was closely followed by spinosad and fipronil [3].On testing spinetoram, a new member of spinosyn insecticides against H. armigera in chilli during Kharif 2009-10 and 2010-11 Spinetoram 12 SC @ 56 g a.i ha^{-1} emerged as the best and optimum dose as it registered lowest number of H. armigera (1.02 larvaeplant^{-1}) at 10 DAS on chilli and recorded the highest green chilli yield of 165.4 q ha^{-1} [16]. The bio-efficacy of new insecticide molecules against capsicum fruit borer, H. armigera, it was shown that 10 DAS, spinosadtreatment reduces number of larvae/plant (0.57)significantly as compared to untreated control (3.00 larvae/plant); while rogor, imidacloprid and quinalphos recorded maximum number of larvae (1.13, 1.10 & 1.10/plant), respectively. These reports lend support to the present findings and revealed that the biorationalinsectides viz. spinosad and emamectin benzoate arevery effective for the management of pest of fruit borer in bell pepper [14].

Ourstudy shows the comparative efficacy of biorational insecticideslikespinosad, emamectin, azadirachtin, B. bassiana,HaNPV and T.chilonis eggs against fruit borer in bell pepperby comparing fruit borer infestation and their effect on yield in each treatment. We recorded highest number of healthy fruit (29.67 & 27.67) per plant from the treatment of spinosad and emamectin benzoate (Table 2) which was followed by the treatment of B. thuringiensis (24.33 fruits/plant). The next best treatments were azadirachtin(21.0fruits/plant), B. bassiana (19.33fruits/plant) and HaNPV (18.67 fruits/plant. We recorded the lowest number of healthy fruit from T. chilonis (16.67/plant), which was followed by the untreated control treatment (14.67/plant). Lowest number of infested fruit per plant was recorded from the treatment of spinosad (1.67) and emamectin benzoate (2.33), which was statistically at par and these, were followed by B. thuringiensis (3.67 fruit/plant). The highest (8.33 fruit/plant) number of infested fruit was recorded from untreated control treatment that was followed by T. chilonis (6.67 fruit/plant), HaNPV (6.33 fruit/plant) and azadirachtin

(5.67 fruit/plant). However, these three treatments differ significantly from the untreated control. Total fruiting stage due to the application of different insecticides in controlling fruit borer showed statistically significant variation in number of infested fruit and for fruit infestation in percentage for number of infested fruit.

The overall mean percentage of fruit infestation as well as percent reduction over control was lowest and highest in spinosad (5.36 and 85.10%) and emamectin benzoate (7.72 and 78.54%) followed by B. thuringiensis (12.62 and 64.92%). The treatments of azadirachtin (19.74 and 45.10%), B. bassiana (23.96 and 33.41%) and HaNPV (25.29 and 29.71%) were not able to reduce the percentage of fruit infestation. The mean percentage of fruit infestation as well as percent reduction over control was highest and lowest in T. chilonis (28.76 and 20.06%). In untreated control plot, the mean percentage of fruit damage increased up to 35.98 per cent.

We validated our results by comparing bell pepper yield per plant. Based on weight of fruits of bell pepper per plant, we show that spinosad (1103.60 g per plant) and emamectin benzoate (1056.87 g per plant) were statistically identical and that was followed by B. thuringiensis and azadirachtin with 866.27 g and 726. 60 g of bell pepper fruits per plant, respectively (Table 3). The treatments of B. bassiana, HaNPV and T. chilonis did not differ significantly with 703.73, 683.20 and 658.33 g of bell pepper fruits per plant, respectively. Lowest weight of bell pepper fruits was recorded in untreated control (532.40 g/plant). Consistent with our earlier findings, maximum weight of infested fruits per plant were present in untreated control (226.16 g/plant). Whereas lowest weight of infested fruits was present in spinosad (41.66 g/plant) and emamectin benzoate (57.40 g/plant) treatments, which were statistically at par. The treatments of B. thuringiensis, azadirachtin, B. bassiana, HaNPV and T. chilonis followed next with 91.66, 133.33, 145.80, 150.73 and 182.66 g weight of infested fruits per plant, respectively. The overall mean percentage of fruit infestation as well as percent reduction over control on weight basis was lowest and highest in spinosad (3.67 and 87.72%) and emamectin benzoate (5.11 and 82.90%) followed by B. thuringiensis (9.25 and 69.06%). The treatments of azadirachtin (15.16 and 49.29%), B. bassiana (17.42 and 41.73%) and HaNPV (18.15 and 39.29%) were not able to reduce the percentage of fruit infestation. The mean percentage of fruit infestation as well as percent reduction over control was highest and lowest in T. chilonis (21.95 and 20.06%) among the tested insecticides. In untreated control plot, the mean percentage of fruit infestation increased up to 29.90 per cent.

As a cumulative effect, we show that the highest marketable fruit yields in plots treated with spinosad (44.86 t ha^{-1}) and emamectin benzoate (42.96 t ha^{-1}), followed by B. thuringiensis (35.21 t ha^{-1}) (Table 1). The yield in azadirachtin (29.53 t ha^{-1}) treated plots was comparable to those of B. bassiana (28.60 t ha^{-1}), HaNPV (27.77 t ha^{-1}) and T. chilonis (42.96 t ha^{-1}). The B: C ratio revealed that a maximum benefit was obtained in treatment with spinosad (1: 2.78) and emamectin benzoate (1: 2.69). B. thuringiensis was placed next receiving the B: C ratio of 1:2.18. Though the other treatments recorded increased yields over untreated control, the net income and the B: C ratio was lower or negative due to the increased cost of production. Overall, on the basis of results, spinosad and emamectin proved their superiority over other chemicals in reducing the percent fruit infestation, maximum percent reduction over control against fruit borer in bell pepper and higher green fruit yield. Similar results were also obtained when spinosad 45 SC @ 0.3 and 0.2 ml was the best treatment against pod borers followed by Indoxacarb 14.5 SC @ 1.0 and 0.5 ml [15]. It was also indicated that among various dosages flubendiamide 20 WG @ 60 g a.i. $ha^{−1}$ recorded highest yield of 7.48 q $ha^{−1}$ with lowest fruit damage of 3.45 per cent followed by flubendiamide 20 WG@ 40 g a.i. $ha^{−1}$ (6.72 q $ha^{−1}$), emamectin benzoate 5 SG @ 11 g a.i. $ha^{−1}$ (7.22 q $ha^{−1}$) and spinosad 45 SC @ 75 g a.i. ha^{-1} (7.32q $ha^{−1}$) [18]. The results of present findings also got support from other workers as it was reported that spinosad 73 to 84 gma.i. ha^{-1} was effective against H. armigera on tomato than quinalphos, lambda cyhalothrin and cypermethrin [5]. On testing the comparative efficacy of some chemical insecticides and botanicals against chilli fruit borer, H. armigera in Bangladesh and reported highest number of healthy fruit (36.20) per plant from the treatment of carbosulfan 25 EC which was at par (36.0) with the treatment of neem leaf extract @ 0.5 kg/2 litre of water. Dharne and Bagde (2011) reported that spinetoram (spinosyn) 12 SC @ 60 g a.i ha^{-1} recorded lowest fruit damage by H. armigera and highest yield in chilli ecosystem [12]. While testing the bio-efficacy of new insecticide molecules against capsicum fruit borer, H. armigera it was reported that spinosad 45 SC @ 0.01 per cent emerged as the best treatment which recorded highest per cent reduction of 76.53, with a highest yield of 30.05 t ha^{-1}. This was followed by chlorantraniliprole with 72.01 per cent. reduction, emamectin benzoate, lambda cyhalothrin, fipronil, and novaluron with 69.61, 68.43, 66.21 and 65.70 per cent reduction respectively [14].

On testing the comparative efficacy of some chemical insecticides and botanicals against chilli fruit borer, H. armigera in Bangladesh and reported highest benefit cost ratio (BCR) (3.51) in the treatments of neem leaf extract @ 0.5 kg/2 litre of water at 7 days interval. On the other, hand the minimum benefit cost ratio (1.21) was recorded in treatment with application of diazinon @ 6.0 ml/2 litre of water at 7 days interval [12]. Similarly, it was reported that use of HearSNPV for fruit borer, H. armigera management on tomato resulted in better benefit cost ratio of 2.58 compared to the 2.28 in farmer practice plot. However, the present findings contradict the findings of these workers reported that use of HearSNPV for fruit borer, H. armigera management on tomato resulted in better benefit cost ratio of 2.58 compared to the 2.28 in farmer practice plot. However, the present findings contradict the findings of these workers for neem leaf extract and HaNPV. The variation in results may be due to the variation in the field conditions and also the commercial formulations used in the study [4].

4. CONCLUSION

This study presents a comprehensive study of various insecticides for eradicating H. armigera on bell pepper. We conclude that Spinosad and ememectin benzoate effects against H. armigera are much more pronounced as compared to other conventional insecticides used. Of these two insecticides, spinosad has high efficacy, low mammalian toxicity, and a good environmental profile, a unique feature of the insecticide unlike others currently used for the plant.It is regarded as natural product-based, and approved for use in organic agriculture by numerous national and international certifications. Our current study is limited to eradicate H. armigera at larval stages. However, if the insect passes this stage, its cure gets difficult. Using similar assays, we will test multiple insecticides on pupal and adult stages of H. amrigera to make the crop of bell pepper, H. amrigera free. Since usage of Spinosad and ememectin benzoate is eco-friendly, we would also like to test these insecticides on other crops to understand the spectrum of these insecticides.

5. REFERENCES

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6. APPENDIX

Table 1. Effect of biorational insecticides on fruit borer, *Helicoverpaarmigera* incidence in bell pepper during 2014

Treatment	Dose (g or ml L^{-1})	Pre count	Mean number of larvae per plant					
			1st Spray			2nd Spray		
			3 DAS	7 DAS	10 DAS	3 DAS	7 DAS	10 DAS
Spinosad 45 SC	0.64	3.20	1.50 (1.55)	1.00 (1.38)	0.80 (1.31)	0.50 (1.20)	0.10 (1.04)	0.00 (1.00)
Emamectin benzoate 5 SG	0.60	2.80	1.40 (1.51)	0.90 (1.35)	0.70 (1.28)	0.40 (1.16)	0.20 (1.08)	0.10 (1.04)
Bacillus thuringiensis var. *kurstaki*8L (17600 I.U. mg^{-1})	3.50	3.10	2.20 (1.78)	1.70 (1.62)	1.40 (1.53)	1.10 (1.43)	0.90 (1.36)	0.70 (1.28)

Azadirachtin 1 EC (10000 ppm)	3.20	2.90	2.70 (1.91)	2.10 (1.75)	1.90 (1.70)	1.60 (1.59)	1.50 (1.54)	1.30 (1.49)
Beauveriabassiana 10 SC ($1x10^{10}$ conidia ml^{-1})	5.54	2.70	2.40 (1.83)	2.20 (1.78)	2.00 (1.72)	1.70 (1.62)	1.60 (1.59)	1.40 (1.53)
HaNPV ($1x10^{9}$PIB ml^{-1})	4.78	3.30	3.10 (2.02)	2.50 (1.86)	2.20 (1.78)	1.90 (1.68)	1.80 (1.65)	1.60 (1.59)
Trichogramma chilonis eggs	100000 ha^{-1}	3.10	3.00 (1.99)	2.80 (1.94)	2.50 (1.87)	2.20 (1.77)	2.00 (1.70)	1.90 (1.68)
Control	-	3.00	3.00 (1.98)	3.10 (2.00)	3.30 (2.05)	3.80 (2.16)	4.20 (2.26)	4.50 (2.32)
LSD(p=0.05)		NS	(0.20)	(0.21)	(0.16)	(0.15)	(0.13)	(0.17)

Table 2. Effect of different biorational insecticides on fruit infestation in number basis by *Helicoverpaarmigera* during 2014

tment	Dose (g or ml L^{-1})	Fruit of Capsicum (no/plant)*			Reduction over control (%)
		Healthy	Infested	Per cent Infestation	
Spinosad 45 SC	0.64	29.67 (5.53)	1.67 (1.62)	5.36 (13.22)	85.10
Emamectin benzoate 5 SG	0.60	27.67 (5.34)	2.33 (1.82)	7.72 (16.10)	78.54
Bacillus thuringiensis var. *kurstaki*8L17600 I.U. mg^{-1})	3.50	24.33 (5.02)	3.67 (2.12)	12.62 (20.53)	64.92
Azadirachtin 1 EC (10000 ppm)	3.20	21.00 (4.66)	5.67 (2.48)	19.74 (26.15)	45.14
Beauveriabassiana 10 SC ($1x10^{10}$ conidia ml^{-1})	5.54	19.33 (4.49)	6.00 (2.64)	23.96 (29.24)	33.41
HaNPV ($1x10^{9}$PIB ml^{-1})	4.78	18.67 (4.42)	6.33 (2.68)	25.29 (30.01)	29.71
Trichogrammachilonis eggs	100000 ha^{-1}	16.67 (4.19)	6.67 (2.76)	28.76 (32.33)	20.06
Control	-	14.67 (3.94)	8.33 (3.04)	35.98 (36.80)	-
LSD (p=0.05)		(0.24)	(0.27)	(4.08)	

Table 3. Effect of different biorational insecticides on fruit infestation on weight basis by *Helicoverpaarmigera* during 2014

Treatment	Dose (g or ml L^{-1})	Fruit of Capsicum (g/plant)			Reduction over control (%)
		Healthy	Infested	Per cent Infestation	
Spinosad 45 SC	0.64	1103.60 (33.19)	41.66 (6.46)	3.67 (10.90)	87.72
Emamectin benzoate 5 SG	0.60	1056.87 (32.48)	57.40 (7.60)	5.11 (13.11)	82.90
Bacillus thuringiensis var. *kurstaki*8L(17600	3.50	866.27	91.66	9.25	69.06

I.U. mg^{-1})		(29.42)	(9.38)	(17.64)	
Azadirachtin 1 EC (10000 ppm)	3.20	726.60 (26.92)	133.33 (11.37)	15.16 (22.68)	49.29
Beauveriabassiana 10 SC ($1x10^{10}$ conidia ml^{-1})	5.54	703.73 (26.44)	145.80 (12.10)	17.42 (24.59)	41.73
HaNPV ($1x10^{9}$PIB ml^{-1})	4.78	683.20 (26.07)	150.73 (12.19)	18.15 (25.02)	39.29
Trichogrammachilonis eggs	100000 ha^{-1}	658.33 (25.58)	182.66 (13.49)	21.95 (27.81)	26.58
Control	-	532.40 (23.01)	226.16 (15.05)	29.90 (33.09)	-
LSD (p=0.05)		(0.91)	(1.55)	(4.53)	

Table 4. Economics of biorational insecticides application for management of fruit borer, *H. armigera*during 2014

Treatment	Yield (t ha^{-1})	Cost of cultivation (Rs ha^{-1})	Gross income (Rsha^{-1})*	Net returns (Rs ha^{-1})	Benefit: cost ratio
Spinosad 45 SC	44.86	193013	538320	345307	2.78
Emamectin benzoate 5 SG	42.96	191045	515520	324475	2.69
Bacillus thuringiensis var. *kurstaki*8L (17600 I.U. mg^{-1})	35.21	193775	422520	228745	2.18
Azadirachtin 1 EC (10000 ppm)	29.53	189792	354360	164568	1.87
Beauveriabassiana 10 SC ($1x10^{10}$ conidia ml^{-1})	28.60	189039	343200	154161	1.82
HaNPV ($1x10^{9}$PIB ml^{-1})	27.77	193730	333240	139510	1.72
Trichogrammachilonis eggs	26.76	188500	321120	132620	1.70
Control	21.63	188000	259560	71560	1.38
LSD (p=0.05)	1.91				